

**Committee Recommendations on FY 2002 Budget
Report and Minutes**

**Federal Aviation Administration
Research, Engineering & Development (R,E&D)
Advisory Committee**

April 11-13, 2000

Includes
Joint Meeting with the
National Aeronautics and Space Administration
Aero Space Technology Advisory Committee (ASTAC)
on
April 12, 2000

**Research, Engineering & Development (R,E&D) Advisory Committee
Holiday Inn Rosslyn Westpark Hotel
1900 North Fort Myer Drive, Arlington, VA 22209**

April 11-13, 2000

On April 11-13, 2000, the Federal Aviation Administration (FAA) Research, Engineering and Development (R,E&D) Advisory Committee (REDAC) held a meeting at the Holiday Inn Rosslyn Westpark Hotel in Arlington, Virginia. Attachments 1 and 2 provide the meeting agenda and meeting attendance, respectively.

DAY ONE – April 11

Welcome and Introductory Remarks

Mr. Robert Doll, Chairman of the Committee, convened the meeting and welcomed attendees. Dr. Herman Rediess, Executive Director and Designated Federal Official of the Committee, read the public meeting notice.

Mr. Doll and Dr. Rediess recognized two departing members Dr. Wesley Harris and Dr. Aaron Gellman for their contributions to the Committee over the last four years. Dr. Rediess also welcomed two new members to the Committee: Mr. Dennis Roberts and Mr. Sam Venneri. Mr. Roberts is the Vice President and Executive Director for Government and Technical Affairs with the Aircraft Owners and Pilots Association (AOPA). Mr. Venneri, who was not able to attend the meeting, replaces Gen. Spence Armstrong as the Associate Administrator for Aerospace Technology at National Aeronautics and Space Administration (NASA) Headquarters.

Mr. Steve Zaidman, Associate Administrator for Research and Acquisitions, discussed recent congressional committee hearings; new authorization legislation titled AIR-21; recent trends in runway incursions; the status of Free Flight Phase 2; Global Positioning System (GPS) Wide Area Augmentation System (WAAS) delays; and increased FAA and NASA cooperation.

Meeting Process and Objectives

Dr. Rediess explained the meeting process and objectives. The primary objective of the meeting was to have the Committee generate recommendations on FAA's planned research and development (R&D) investments for fiscal year (FY) 2002. Dr. Rediess would present FAA's planned R&D investment portfolio. Each subcommittee, having already reviewed FAA's respective R&D program, would present its recommendations. Then, the Committee would discuss issues and generate recommendations to provide to the Administrator.

Additional objectives included a joint meeting with NASA's Aero Space Technology Advisory Committee (ASTAC) on April 12, and a proposal from FAA and NASA for REDAC and ASTAC to collaborate on an Aviation System After Next R&D planning effort.

Remarks

Mr. Doll announced that Congresswoman Connie Morella, U.S. House of Representatives and Chair of the Committee on Science Subcommittee on Technology, would not be able to attend the REDAC meeting. However, the FAA Administrator would be able to attend, and he introduced her to the Committee.

Hon. Jane F. Garvey, FAA Administrator, thanked the Committee for inviting her and addressed three important topics: FAA's approach to its focused agenda; the AIR-21 authorization bill; and the President's request for a 45-day plan.

FAA's R&D Investments for FY 2002

Each year in September, the Committee provides guidance to FAA for preparing its upcoming R&D investment portfolio (current year plus three). During the last meeting on September 14-15, 1999, the Committee formulated guidance for FAA's FY 2002 R&D investments. The Committee provided its formal recommendations to the Administrator by letter dated December 17, 1999. Dr. Rediess provided a review of the guidance with FAA's response. FAA will provide a formal response by letter.

Dr. Rediess provided an overview of FAA's R&D investments including a review of the FY 2001 President's budget request including R,E&D, Facilities and Equipment (F&E) and Airport Improvement Program (AIP) funded R&D as well as related NASA budgets. He then provided an in-depth review of the proposed FY 2002 investments.

Aviation System After Next R&D Planning

Dr. Rediess presented a proposal for developing a future vision of the aviation system. Current research addresses aviation needs through 2015 to 2020. This is called the "Next" Generation Aviation System. However, there is a need to develop a vision beyond the next generation, because of the long lead-time required to conduct and implement research. FAA and NASA are proposing a planning activity to develop a vision for the Aviation System "After Next" to address the timeframe from 2020 to 2050. The vision would guide NASA's long-term research. The two agencies want to involve all stakeholders in the effort and propose that REDAC and ASTAC form a joint task force to lead the effort to develop the vision.

Mr. Doll deferred any vote on the proposal by the REDAC until day two of the meeting when the Committee would meet jointly with the ASTAC to review the proposal.

Subcommittee Recommendations

In February and March 2000, the six standing subcommittees reviewed FAA's six R&D investment areas including air traffic services; airport technology; aircraft safety; aviation security; human factors; and environment and energy. The subcommittees reviewed their respective Program Planning Team's (PPT) proposed investment portfolio and provided recommendations on it. Each standing subcommittee chair, as listed below, presented these recommendations to the Committee. Attachment 3 provides the recommendations.

Air Traffic Services	Mr. Paul Drouilhet
Airport Technology	Ms. Angela Gittens
Human Factors	Dr. Deborah Boehm-Davis

Mr. Doll adjourned the meeting for the day at 4:30 p.m. with subcommittee recommendations to continue on day two of the meeting.

DAY TWO – April 12

Mr. Doll convened the meeting and welcomed members and visitors. Dr. Rediess read the public meeting announcement.

Subcommittee Recommendations (continued)

Mr. Doll continued the reports from the standing subcommittee chairs as follows. Attachment 3 provides the recommendations from each standing subcommittee.

Aviation Security	Mr. Viggo Butler
Aircraft Safety	Dr. Lou Mancini
Environment & Energy	Mr. Jim DeLong

Update on Vertical Flight Subcommittee

This subcommittee originally was called the Subcommittee on General Aviation and Vertical Flight but now is called the Tiltrotor and Advanced Rotorcraft Technology in the NAS (TARTNAS). It is an ad hoc subcommittee that was established on April 8, 1997, to investigate general aviation and vertical flight issues.

The Committee re-established the subcommittee's terms of reference on January 21, 1999, to investigate what research activities, efforts and criteria are necessary to determine how the combination of GPS, tiltrotor and advanced vertical flight technology can be exploited to better serve the air traveling public and air commerce. Mr. John Olcott co-chairs the subcommittee along with Mr. John Zugschwert, former REDAC member.

Mr. Zugschwert provided a status update of the subcommittee's activities. The co-chairs have assembled a wide array of stakeholders to participate in the subcommittee. The subcommittee plans to formulate a report to present to the Committee in September.

Small Aircraft Transportation System (SATS) Terms of Reference

On September 14, 1999, Committee members voted and approved a working group led by Mr. Paul Fiduccia to examine NASA's Small Aircraft Transportation System (SATS) program and, by the April 2000 meeting, recommend whether REDAC should form an ad hoc subcommittee to study the program in depth.

Mr. Paul Drouilhet presented the terms of reference for a SATS Subcommittee on behalf of Mr. Fiduccia, who was unable to attend. The proposal was for REDAC and ASTAC to form a joint, ad hoc subcommittee for the period of one year through April 2001, for the purpose of monitoring FAA, NASA, and National Research Council (NRC) activities related to SATS. Mr. Paul Fiduccia from REDAC and Capt. Robert Buley from ASTAC would co-chair the subcommittee.

The Committee voted to approve the SATS Subcommittee terms of reference with the following changes: first, a title change to reflect both the FAA REDAC and NASA ASTAC; and second, a date change from 1999 to 2000, below the title.

Joint Meeting with NASA ASTAC

Mr. Robert Doll, Chair of the REDAC, and Mr. James Sinnett, Chair of the ASTAC, convened the joint meeting of the FAA REDAC and NASA ASTAC at 1:00 p.m. They welcomed members and expressed appreciation for the cooperative relationship between FAA and NASA.

Dr. Herm Rediess, FAA, reminded members to nominate candidates for the FAA Excellence in Aviation Award. Members received ballots.

Icing Research Overview

Mr. John O'Brien, joint member of both committees and Chair of the ASTAC Aviation Operations Systems (AOS) Subcommittee, provided an overview of NASA's icing research and recommendations from the AOS Subcommittee.

Icing remains a hazard to safe flight, and a number of icing related accidents and incidents occurring between 1980 and 1999, some fatal, form the basis for the NASA icing program, which resides at Glenn Research Center (GRC). The AOS Subcommittee identified several issues related to strategic management, program management, personnel and equipment concerns as well as recommendations on specific areas of research.

The subcommittee recommended a government and industry icing-workshop hosted by GRC this summer. The purpose of the workshop should be to plan, prioritization, and commit to investing in icing-related R&D for the purpose of developing a unified national plan. Mr. O'Brien agreed to work with NASA and FAA to help structure the workshop. Mr. Robert Jacobsen, Manager of the Advanced Air Transportation Technology Office at NASA Ames Research Center, agreed to organize the workshop and involve the appropriate FAA personnel.

Small Aircraft Transportation System (SATS) Report

Dr. Bruce Holmes, Manager of the General Aviation Office at NASA Langley Research Center, presented the NASA Small Aircraft Transportation System (SATS) Program. The SATS concept involves using small aircraft to provide personal, door-to-door, air transportation for people and cargo. The benefits include saving time compared to either ground or commercial air travel and stimulating economic growth by providing increased accessibility to communities within the United States. The program includes the infrastructure necessary to implement this concept.

SATSLab is a series of experiments starting in 2003 that will culminate in a demonstration in 2005 to prove the SATS concept. The States of Virginia and Florida are candidates for the demonstration. Currently, there is a National Research Council (NRC) study underway to determine whether or not SATS is in the public interest and, if so, how the program should proceed.

SATS Subcommittee:

Mr. Doll informed Mr. Sinnett that REDAC voted to approve the joint SATS Subcommittee terms of reference. Mr. Sinnett requested that the ASTAC review the terms of reference; then, the ASTAC voted to approve the joint SATS Subcommittee terms of reference.

ATM Steering Committee Report and ATS Subcommittee Comments

In October 1999, the NASA Air Traffic Management (ATM) R&D Executive Steering Committee (ESC) met jointly with the REDAC ATS Subcommittee to review NASA's ATM research program. Dr. Victor Lebacqz, Deputy Director of Aerospace at NASA Ames Research Center, presented the ATM ESC report. Mr. Paul Drouilhet, Chair of the REDAC ATS Subcommittee, presented the ATS Subcommittee's comments.

The Advanced Air Transportation Technologies (AATT) and Terminal Area Productivity (TAP) programs provide new automation tools and technologies for the air traffic control tower, terminal, and center facilities. The objective of these programs is to assist air traffic control from surface movement and departure, through en route flight, to final approach and landing.

Both committees were pleased with the improved coordination between FAA and NASA on the ATM research program. Both committees indicated a need for increased effort on the part of both agencies to solve the problems surrounding the implementation of NASA research products by FAA. The committees discussed the need to align NASA software design, development, validation, and certification processes with FAA and industry processes. Both committees agreed that NASA needs to maintain a long-term research emphasis, and FAA should participate in the definition of these research efforts. The two committees disagreed on the ATM ESC recommendation for RTCA to establish a National Air System Operational Concept for 2006 and beyond so that NASA can define research to support it. Mr. Drouilhet noted that a better focus would be on disruptive technologies – implementing currently available technologies in innovative ways.

Aviation System After Next R&D Planning

Dr. Rediess, FAA, and Mr. Robert Pearce, Director of the Goals Division at NASA Headquarters, presented a proposal for developing a future vision of the aviation system. The committees received the same presentation as Dr. Rediess provided to the REDAC on day one of the meeting.

The REDAC and ASTAC members discussed the proposal and voted to approve a joint task force to guide the vision development process. Mr. Sinnet nominated Mr. Robert Spitzer as the ASTAC Chairman of the Task Force. Mr. Doll nominated Mr. Paul Drouilhet as the REDAC representative. The chairmen charged these two representatives to work with FAA and NASA to formulate a small team to guide the vision development process.

Closing

Mr. Doll and Mr. Sinnet thanked all of the members for their participation and adjourned the joint meeting of the REDAC and ASTAC at 5:00 p.m. Both committees planned to reconvene separately on the following day.

DAY THREE – April 13

Mr. Doll reconvened the REDAC meeting, and Dr. Rediess read the public meeting announcement.

Committee Recommendations

Mr. Doll opened the floor to the Committee members to discuss recommendations on FAA's planned FY 2002 R&D investments. The Committee held discussions and generated recommendations, which Mr. Doll provided to the Administrator by letter dated July 13, 2000. Attachment 4 provides the Committee's report.

Closing

Mr. Doll requested each standing subcommittee review the appropriate Flagship Initiatives during its summer meeting and report back to the Committee in September.

Mr. Doll thanked the members who remained on the third day of the meeting to help generate the recommendations to the Administrator. He announced the next REDAC meeting date as September 12-13 at the same location, and then he adjourned the meeting at 12:00 noon.

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**Research, Engineering & Development Advisory Committee (REDAC)
 Holiday Inn Rosslyn Westpark Hotel
 1900 North Fort Myer Drive, Arlington, VA
 (703) 807-2000 FAX: (703) 522-7480**

April 11-13, 2000

AGENDA

Day 1 – April 11 – REDAC

9:00 am – 9:30 am	Welcome and Introductory Remarks	Mr. Robert Doll, Chairman Mr. Steve Zaidman, FAA
9:30 am- 9:45 am	- Farewell to Retiring Members (Aaron Gellman & Wes Harris) - Welcome New Member (Dennis Roberts, AOPA)	Dr. Herman Riediess, FAA
9:45 am – 10:00 am	Meeting Process and Objectives	Dr. Herman Riediess, FAA
10:00 am – 11:15 am	Remarks	Hon. Jane Garvey, FAA Hon. Connie Morella, U.S. House of Representatives
11:15 am – 11:30 am	BREAK	
11:30 am – 12:00	FAA's R&D Investments for FY 2001 and FY 2002	Dr. Herman Riediess, FAA
12:00 noon –1:30 pm	LUNCH	
1:30 pm – 2:15 pm	Aviation System After Next R&D Planning	Dr. Herman Riediess, FAA
	<u>Subcommittee Recommendations</u>	
2:15 pm – 3:00 pm	Subcommittee on Air Traffic Services	Mr. Paul Drouilhet
3:00 pm – 3:15 pm	BREAK	
3:15 pm – 4:00 pm	Subcommittee on Airports	Ms. Angela Gittens
4:00 pm – 4:30 pm	Subcommittee on Human Factors	Dr. Deborah Boehm-Davis
4:30 pm	Adjourn	

Day 2 – April 12 – Morning Session REDAC

<u>Subcommittee Recommendations</u>		
8:00 am – 8:45 am	Subcommittee on Security	Mr. Viggo Butler
8:45 am – 9:30 am	Subcommittee on Aircraft Safety	Dr. Lou Mancini
9:30 am – 10:15 am	Subcommittee on Env. & Energy	Mr. James DeLong
10:15 am – 10:30 am	BREAK	
10:30 am – 10:45 am	Update on the Vertical Flight Subcommittee	Mr. John Zugschwert
10:45 am – 11:00 am	SATS Subcommittee – Terms of Reference Approval	Mr. Paul Fiduccia
11:00 am – 12:00 pm	Committee Discussion (Continue on April 13)	Mr. Robert Doll, Chairman
12:00 pm – 1:00 pm	LUNCH	

Day 2 – April 12 – Afternoon Session Joint with REDAC & NASA ASTAC

1:00 pm – 1:20 pm	Opening Remarks	Mr. Robert Doll, Chairman Mr. Jim Sinnett, Chairman Mr. Steve Zaidman, FAA Dr. Sam Venneri, NASA
1:20 pm – 2:05 pm	Icing Research Overview	Mr. Jack O'Brien, ASTAC
2:05 pm – 2:50 pm	Small Aircraft Transportation System (SATS) Report	Mr. Paul Fiduccia, REDAC Dr. Bruce Holmes, NASA
2:50 pm – 3:05 pm	BREAK	
3:05 pm – 3:50 pm	ATM Steering Committee Report ATS Subcommittee Comments	Dr. Vic Lebacqz, NASA Mr. Paul Drouilhet, REDAC
3:50 pm – 4:35 pm	Aviation System After Next R&D Planning	Dr. Herman Rediess, FAA Mr. Bob Pearce, NASA
4:35 pm – 5:00 pm	Discussion/Closing	Mr. Robert Doll, Chairman Mr. Jim Sinnett, Chairman

Day 3 – April 13 REDAC

9:00 am – 10:45 am	Finalize Committee Recommendations	Mr. Robert Doll, Chairman
10:45 am – 11:00 am	BREAK	
11:00 am – 12:00	Finalize Committee Recommendations	Mr. Robert Doll, Chairman Mr. Steve Zaidman, FAA
12:00 Noon	Adjourn	

**Research, Engineering & Development (R,E&D) Advisory Committee
Aero-Space Technology Advisory Committee (ASTAC)
April 11-13, 2000**

Attendance

REDAC Members – April 11-13, 2000

Mr. Robert Doll, Chairman	Dr. Mike Benzakein	Mr. Viggo Butler
Dr. Deborah Boehm-Davis	Mr. Jim DeLong	Mr. Paul Drouilhet
Capt. Chet Ekstrand	Dr. Wilson Felder	Dr. Aaron Gellman
Ms. Angela Gittens	Dr. Wesley Harris	Dr. John Hansman
Dr. Joseph Jackson	Dr. Louis Mancini	Mr. John O'Brien
Mr. Dennis Roberts		
Hon. Jane Garvey, Administrator	Mr. Steve Zaidman, FAA	Dr. Herm Rediess, FAA

ASTAC Members – April 12, 2000

Mr. Jim Sinnett, Chairman	Capt. Robert Buley	RADM Joe Dyer
Mr. Kris Kuck	Dr. Norris Krone	Mr. Frank Lynch
VADM Robert Monroe	Dr. Helen Reed	Dr. Ken Rosen
Mr. Robert Spitzer	Dr. Susan Wu	Mr. Benjy Neumann, NASA

Audience

Lee Olson, FAA	Tony Freck, GE Aircraft	John Wiley, FAA
Nancy Lane, FAA	Ken Peppard, FAA	Gloria Kulesa, FAA
Gregory Gottlieb, CargoLifter AG	Bill Edmunds, ALPA	Kenneth Cobb, TRW
Brett Wilson, Rockwell	John Zugschwert	Bruce Holmes, NASA
Peter McHugh, FAA	Dennis Filler, FAA	Mike Gallivan, FAA
Charles Huettner, OSTP	Paula Frankel, NASA	Joseph McCormick
Paul Polski, FAA	Dennis Kershner, JHU/APL	Lee Norvell, FAA
Lyle Malotky, FAA	George Marania, FAA	Dave Smith, FAA
Quinten Johnson, FAA	Vic Lebacqz, NASA	Paul Jones, FAA
Calvin Mitchell, FAA	Robert Jacobsen, NASA	Cindy Peak, ATCA
R. Carey Beer	Sharon Darnell, FAA	Roy Reichenbach, NASA
Howard Wesoky, FAA	Chuck Ruehle, FAA	Rick Page, FAA
Ron Swanda, GAMA	Barry Scott, FAA	Terry Kraus, FAA
Tom Proeschel, FAA	Larry Kiernan, FAA	Chris Seher, FAA
George Skaliotis, Volpe	Randy Stevens, FAA	Steve Pansky, FAA
Joel Wilcox, FAA	Mike Mears, DSMC	Paul Kelleher, Arch Tech.
Hugh McLaurin, FAA	Keith Murray, SETA	Jim Rowlette, FAA
James Steuart, NASA	George Chang	Nelson Miller, FAA
William Falter, NASA	Jeff Breunig, FAA	Warren Fellner, FAA
MaryEllen McGrath, NASA	Terrence Hertz, NASA	John Rekstand, FAA

Kathy Miljant	Paul Jankowski, FAA	Joe Elliott, NASA
Dell Ricks, NASA	Ron Hochstetter, SAIC	Chuck Larson, FAA
Frank Petroski MITRE/CAASD	Bob Peak, COGENT/ERAU	Allan Overbey, DOD
Wesley Link, MITRE/CAASD	Paul Murphy, SETA	John Leverton, AHS
William McE. Miller, Aereon	Bob Rosen, NASA	Bob Pearce, NASA
Rosanne Marion, FAA	Michael Shapiro, SETA	Karen Stewart, FAA
Paula Bline, ACC	John Fielding, Raytheon	Kenneth Klasinski, FAA
Steve James, British Embassy	Jim White, FAA	Sieg Poritzky
Lee Tucker, ITT	Mike Wahl, TRW/SETA	John Rybka, FAA
Richard Young, Cygracom	David Cherry, FAA	Jim Crook, ATCA
Patrick Lewis, FAA	Jim Branstetter, FAA	Dave Ford, FAA
Clyde Miller	Fenton Carey, DOT	Virgenia Embrey, FAA
Paul Dykeman, FAA	Ed Gervais, Boeing	James Rogers, FAA
Marcie Romagnoli, SETA	Paul Rich, SAIC	Phil Yu, TRW
Mark Rodgers, FAA	Gary Skillicorn, FAA	Nick Stoer
M. Salloum, FTSS	Denise Davis, FAA	June Lidder, SETA
Alan Levin, USA Today	Glen Hewitt, FAA	Carole Schmidt, Crown
Jeff Breunig, Arthur D Little	Gloria Dunderman, Crown	Satish Agrawal, FAA

Recommendations on FAA's 2002 R&D Investments – April 11, 2000

Report from the Air Traffic Services Subcommittee

Chairman: Mr. Paul Drouilhet

The following is a summary of the ATSSC's observations and recommendations.

OVERALL R&D PROGRAM

In general, the R&D program is addressing the important issues. In most cases it was not possible for the ATSSC to judge the absolute adequacy or relative balance of the funding allotted to the individual program elements, as in the limited time available the presentations could not give enough detail on funding issues to make such judgments. However, as has been the case in the past, the overall R&D funding is inadequate to support aggressive ATC modernization. Members expressed continuing concern about the slow pace of ATC modernization, and the pace of the supporting R&D. Although it was emphasized many times in the presentations that the program was "benefits driven", the observation was made that a benefit postponed is a benefit lost.

R&D MANAGEMENT

The ATSSC is concerned about the lack of coherence of R&D management, which has resulted from the transfer of a substantial part of the ATS R&D funding to the F&E budget. Different FAA offices are responsible for the management of the R&D and the F&E programs and the corresponding budgets. The R&D activities funded from the F&E budget compete for funds with other, large F&E programs. The ATSSC is concerned that the funds which support the R&D activities which were transferred by Congress to the F&E account may be lost to the R&D program when the particular projects are completed.

Recommendation: The ATSSC recommends that a single entity within the FAA be given the responsibility for managing the R&D program and its associated funding (whether from the R&D or F&E account), and that the F&E funds which are supporting R&D activities be fenced so that they will continue to be available for R&D activities. The ATSSC also recommends that the FAA adopt a more rational way of classifying program/funding categories, perhaps patterned after the DoD scheme of 6.1 through 6.5 to designate the range from basic research through production and field support.

WEATHER

Improvement in aviation weather nowcasting and forecasting are critical to enhancing aviation safety and efficiency. The ATSSC is pleased by the continuing progress in the development of aviation weather products. It was concerned, however, that insufficient attention is being given to making these enhanced and new products available to the aviation user – especially to the cockpit. Several of the new products will be distributed through the Aviation Weather Center.

ATS Subcommittee (continued)

Until they are evaluated by the AWC and approved for operational use, carriers and other commercial operators may not use them. This step is necessary before the FAA's investment in the development of these weather products can bear fruit.

Recommendation: The ATSSC recommends that the FAA work with the National Weather Service (NWS) to expedite the completion of the development and certification of weather products so that they can be made part of the aviation weather data base and disseminated to users through the aviation weather networks.

SMALL AIRCRAFT TRANSPORTATION SYSTEM (SATS)

The chairman of the REDAC Subcommittee on SATS briefed the ATSSC on the SATS program and the planned activities of that subcommittee. While there are numerous technical and economic hurdles which must be overcome, the ATSSC believes that the SATS concept has the potential for providing a significant addition to the U.S. transportation system. In order to realize this potential, it is imperative that SATS be able to fit compatibly into the evolving aviation infrastructure. Although the SATS R&D is being carried out almost exclusively by NASA, the ATSSC believes that it is essential that the regulatory and operational elements of the FAA participate in and help steer the development to ensure this compatibility.

Recommendation: The ATSSC recommends that the FAA establish a SATS team (perhaps modeled on the SOIT), cochaired by representatives of ATS and AVR. This team would serve as the interface between the FAA and the NASA SATS program, would help guide the SATS program to ensure that it develops in a way which the NAS can accommodate, and would address the certification and operational issues.

AVIATION SYSTEM CAPACITY

The ATSCC was briefed on a proposal to establish within the FAA an entity to serve as a single point of contact between the FAA and airports wishing to carry out short-term capacity enhancements. This FAA entity would include representation from all relevant parts of the FAA, including operations, certification, airports, and development and acquisition. The ATSCC supports the establishment of such an entity, but does not view it as an R&D activity, and thus not appropriately funded from the R&D budget. It does envision, however, that it might be a sponsor for capacity-related R&D activities.

Recommendation: The ATSCC recommends the re-establishment in the FAA of a single focal point/advocate for prioritization and early implementation of capacity enhancements for specific airports and terminal areas. This "capacity enhancements advocate" would work with responsible FAA elements and with airports and users to help implement new capacity capabilities and technologies as they become available. Cooperative efforts and joint financing should be considered where appropriate.

ATS Subcommittee (continued)

SOFTWARE ENGINEERING RESOURCE TEAM (SERT)

The ATSSC was pleased that the FAA has established a focal point for software engineering. The ATSSC had recommended such an action several years ago following its original ad hoc study, and has repeated the recommendation several times since. However, while applauding the start, we are concerned that the current effort is subcritical given the enormity of the software engineering effort facing the FAA. Examples of two areas needing critical attention are information security and site adaptation.

Recommendation: The ATSSC recommends that the FAA increase the resources available to the SERT, both in terms of funding and personnel. It views this as a high priority action because the FAA is becoming increasingly dependent on software-intensive systems, and the expanding use of COTS software is resulting in new issues of software maintenance.

RUNWAY INCURSION PREVENTION

The ATSSC was briefed both on FAA efforts to reduce runway incursion incidents through procedures and training and through the development and implementation of new technology. After encountering problems with a comprehensive effort to eliminate all runway incursions, the FAA is currently focusing on reducing those runway incursions which are the most likely to cause accidents and is emphasizing measures to reduce incursions by means of prevention through training, continuing awareness, and/or implementation of low-cost devices which address human error and provide direct help to pilots/operators. The ATSSC is pleased to see that FAA's current efforts put major emphasis on measures, which are intended to directly aid pilots and vehicle operators to avoid incursions.

However, it has been frequently pointed out that the current definitions of runway incursions, as well as the current data acquisition and analysis processed, are troublesome and may give FAA management and users misleading information.

Recommendation: The ATSSC recommends that the FAA

- i. mount a concentrated effort to develop better and more objective measures and definitions of runway incidents;
- ii. improve the accuracy and utility of runway incident reports and, as needed, develop a more effective and valid uniform data collection process, so as to create more effective means for FAA management to understand and use incident data;
- iii. establish controls to ensure the accuracy and completeness of reported runway incursion and runway incident data;

ATS Subcommittee (continued)

- iv. identify the relative risks of accident for various types of incidents, and search for ways to better identify the incidence (rates and type) of runway events at general aviation and non-towered airports.

MULTISERVICE MULTIMODE SYSTEM (MMS)

The ATSSC was briefed on a proposed R&D program to investigate the use of “impulse technology” for navigation, surveillance, and communication on the airport surface and in the airspace in close proximity to the airport. In general the ATSSC encourages the FAA to investigate high risk technologies which would have substantial payoff to NAS operations if they can be successfully implemented. However, in the case of MMS, it did not appear that either the technical issues of implementing such a system or the benefits of such a system as compared with current approaches to airport CNS were well enough understood to justify initiating an aggressive R&D program at this time.

Recommendation: The ATSSC recommends that the FAA work with its technical advisors to better understand the technical issues of implementing an airport environment CNS system based on impulse technology, and the potential benefits of such a system as compared with current approaches to airport CNS. If the results of this effort indicate that such a system is both technically feasible and potentially cost-beneficial, it would then be appropriate to proceed with an R&D activity.

Recommendations on FAA's 2002 R&D Investments – April 11, 2000

Report from the Airports Subcommittee

Chair: Ms. Angela Gittens

Recapitulation of guiding principles the Subcommittee used in evaluating the research portfolio:

- Focus on highest priorities
- Focus on agenda peculiar to civil aviation
- Publish findings along the way
- Leverage resources of others: governments, academia, private industry

Observations:

Overall, the Airport research section has developed and undertaken its portfolio in agreement with the guiding principles.

The subcommittee met at the William J. Hughes Technical Center on February 22-23. The Airport Technology budget has been moved from F&E to AIP; the Subcommittee agrees that this is a more appropriate area.

The Pavement Test Machine is in full operation; however, premature (and unexplained) cracking is occurring.

Significant Accomplishments in 1999:

- Published Airport Wildlife Hazard Management report, incorporating research results and literature review of active and passive harassment, habitat and population management techniques.
- Integrated National Wildlife Strike database into the development of a Civilian Advisory System.
- Completed evaluation of LED light strips to enhance paint marking in non-movement areas.
- Installed fiber optic, distance remaining signs (Pittsburgh Airport).
- Completed penetrator nozzle design enhancement testing.
- Update of Advisory Circular on guidelines for Very Large Airside Development.
- Operated infrared aircraft deicing in full operation at 2 airports.
- Advisory Circular for Aircraft Arrestor beds.

Airports Subcommittee (continued)

- Completed LEDFAA model enhancements and 3D-FEM rigid pavement models (pavement design enhancements).

Recommendation Highlights:

Increase funding level to \$10 million, up from \$7.3 million in the President's '01 budget: recommended levels by Research Project are shown on the last column of the attached table. Start shifting funds towards safety projects: visual guidance, runway friction, wildlife hazards, and firefighting.

Major increase in the visual guidance section to increase research on Electromagnetic Interference and integration of airfield lighting power, circuiting, and control systems. The subcommittee has previously accorded low priority to Airport Planning and Design research, on the theory that airports and the airport design industry provide a great deal of resource in this area. However, in view of the billions of dollars in upcoming airport development and the FAA's role in evaluating PFC funding for these projects, airports and airlines have requested FAA guidelines on master plans, terminal sizing, and passenger distribution patterns. The Subcommittee supports a major increase for updating the 20-year old terminal building guidance and research on the impact of New Larger Aircraft and Regional Jets on airfield design standards.

Continue pavement research projects, including funding for replacement of pavement on schedule (funding level does not consider resolution of the premature pavement cracking problem).

Additional Areas for Research:

More emphasis on CFR truck stability or other factors that would enable faster trucks so airports can meet response-time standards without building additional fire stations as airports expand.

More research on pavement construction and maintenance techniques.

Use of operational aircraft braking data to investigate pavement roughness and friction; the Transportation Research Board of the National Research Council has expressed an urgent concern for research on the effects of pavement surface roughness on aircraft stopping distances.

Consideration of moving to a GPS approach for ground vehicle identification rather than radio frequency methods.

Recommendations on FAA's 2002 R&D Investments – April 11, 2000

Report from the Aircraft Safety Subcommittee

Chairman: Mr. Lou Mancini

Committee Deliberations

General portfolio observations/recommendations by the Subcommittee were that:

- FAA safety goals do not match research investment levels
- A program that is under funded by about 10% is reasonable
- The technical teams concept should bring in industry perspective
- Research needs to be protected
- Safety research needs one focal point in the Agency
- Portfolio presentations should include first year and last year funding for tasks
- Airborne Data Monitoring is an exemplary program
- FAA research should not subsidize industry, rather it should leverage industry work
- Subcommittee would like more information about software research at the next meeting
- The Risk Assessment work should redefine ways to achieve system safety goals
- The Certification Job Aid should be expanded to include other FAR parts
- Continue and enhance leverage with private sector (matching funds), other government agencies, and other countries.
- Insure that Fire Research and Safety projects receive high priority in Aircraft Safety

Issues

- Program Management: PPTs
- Structured, quantitative process to identify research requirements, e.g., AHP
 - Stakeholder involvement
 - FAA policy organizations
 - FAA research organizations
 - Technical experts
 - Links to industry and academia
- Program Management: FAA
- Research vs. Acquisition functions
- Industry model
- Research focus for Agency goals
- One organization responsible for safety research
- Efficiency and Security?
- Program Management: International Aviation Community Cooperation
- Private sector, e.g., airlines, manufacturers, academia
- Other government agencies, e.g., NASA, DoD
- Other countries and authorities, e.g., JAA

Recommendations on FAA's 2002 R&D Investments – April 11, 2000

Report from the Security Subcommittee

Chairman: Mr. Viggo Butler

The committee repeated its concern over the apparent disconnect between the FAA's goal of 100% EDS level HBS by 2010 and the lack of research identified to get FAA there.

Portfolio Content

The committee was generally supportive of the approach taken by FAA. All of the potential priority threats are covered. However a number of projects were seen that did not appear to take FAA to its primary goals. The Policy goal of achieving 100% hold bag screening with EDS level technology by 2010 was seen as desirable, but at this point not achievable.

Partnerships

The FAA is doing an excellent job of leveraging and collaborating with others within Government and both domestically and internationally. FAA is making good use of all potential contributors within academia, industry, and the national laboratories.

Process

The process used by FAA this year was clear and made efficient use of the panel's time. The AAR-500 briefings were clear and concise. Requirements from the sponsor have been effectively communicated and are captured in several documents.

Panel Observations and recommendations

The target budget of \$50.8M for 2002 will NOT allow the FAA to achieve its goal of 100% hold baggage screening in 2010. Dramatically different technologies will be required because not only must the systems be 20 times faster to totally accommodate the current bag flow, but there will be over 50% more passengers in 2010. FAA's goal is to not additionally burden the industry by keeping the cost and size of the EDS systems similar to those being fielded today. In response to this identified shortfall AAR-500 identified \$11M (per year) in additional research necessary to develop the required EDS technology. The panel suggested that the Budget for 2002 be increased by \$6M and the additional \$5M required be realized by cutting projects not leading to primary FAA goals. (Subsequent to this meeting FAA identified \$38.4M in Flagship initiatives for security in 2002 which included the \$11M identified for EDS new technologies.)

The Panel observed that FAA's requirements have expanded to include the screening of baggage on domestic as well as international flights. This expansion in mission has expanded the challenge of the SEIPT who is currently fielding EDS technology in the nation's largest airports. The capital, maintenance, and operational costs of the current systems are high. A need exists for systems with the same level of performance but lower throughput and lower costs. The crash development of the ARGUS system to fill the low cost EDS requirement for smaller airports has taken \$10+M out of the current R&D program. The panel questioned the ARGUS specifics, that is the use of hard criteria and how the economic analysis was done. What tradeoffs were done balancing R&D time and cost vs. deployment time and costs? (A presentation on standard

Security Subcommittee (continued)

setting for ARGUS may be appropriate for the next meeting) Earmarks for research were seen as not efficient contributions to achieving FAA security goals.

The FAA should look at limited finding and deploying EDS systems at airport locations today where you could do 100% of the bags. This would be a model and help FAA prepare for the problems and set the requirements for 100% HBS in 2010. The Panel would like to see the completed report of the ACS program plan.

Recommendations on FAA's 2002 R&D Investments – April 11, 2000

Report from the Human Factors Subcommittee

Chair: Dr. Deborah Boehm-Davis

The committee met twice since the last full meeting of the REDAC: in December 1999 at CAMI in Oklahoma and in February 2000 at the Technical Center in New Jersey. The committee plans to meet in July 2000 at Volpe in Massachusetts. Between meetings, the committee has held discussions using an e-mail discussion list.

In the meetings, the committee heard briefings on current research projects from researchers at that location. The committee also heard briefings on the overall portfolio, portions of the contract research program, as well as issues, concerns, and funding levels. Finally, some time at each meeting was reserved for committee discussion of what we had heard. The committee's goal is to have a full review of current projects -- both in-house and sponsored, as well as review of planned future investments over each two-year period. This should allow the committee to evaluate the execution of the work as well as what is in the pipeline for the future.

The current portfolio under the direction of the Chief Advisor for HF includes three primary areas, in order from area of greatest investment to least:

- Flight Deck/Aircraft Maintenance (2002: \$10,437,000)
- Air Traffic and Airway Facilities (2002: \$10,400,000)
- Aeromedical (2002: \$5,372,000).

Within the first two areas (flight deck/aircraft maintenance and air traffic and airway facilities), the research falls into a number of common topics. This creates an alternate way of describing the portfolio content (in \$000).

Flightdeck/Maintenance/Systems Integration & Air Traffic Control/Airways Facilities (\$11,537)

- Human-Centered Automation (\$4,078)
- Selection & Training (\$3,195)
- Information Management & Display (\$2,602)
- Human Performance Assessment (\$1,662)

Aeromedical (\$5372)

- Medical/Toxicology/Factors of Accident Investigation (\$2,754)
- Human Survival & Protection in Civil Aviation (\$2,509)
- Cabin Health & Environmental Guidelines (\$109)

Personnel/Other Costs (\$9659)

A more complete description of the programs contained within each of these research areas is shown in the Appendix. The committee felt it important to note that this funding represents only a very small increase over the level of funding in 2001. This is disturbing at a time when the FAA is talking about increasing throughput and maintaining or decreasing error. The committee finds it difficult to believe that this can be done with a lesser investment in the human factors arena.

Human Factors Subcommittee (continued)

The committee discussed the balance between sponsored research and the investment in personnel and other costs (\$16.8 spent on research, with \$9.6 on personnel/other costs). We were not clear if this is the right balance, but we recognize that people are a “sunk” cost. That is, you can’t reduce the work force, so this portion of the budget will only go up with inflation; thus, the committee recognizes that increments in overall funding are needed just to cover the basic work currently being done.

The committee engaged in an exercise where they rated the importance of each area of research. On a scale of 1-5 (with 5 being very important), all areas were rated as important (3 or above, but mostly 4s and 5s), but the committee did question a few specific areas and projects. Specifically, for example, they felt that some of the projects listed under human-centered automation in the flight deck arena seemed to overlap into other areas, such as selection and training. Further, they felt that the overall organization of the flight deck research program didn’t seem to have mutually exclusive and exhaustive categories. In contrast, the members felt that the ATC/airway facilities projects were strongly attuned to the work the FAA should be doing and that the projects seem to fit together as a cohesive whole.

However, another committee member pointed out that the flight deck projects described form a special focus by their orientation to problems of automation. This is important, as one committee member said, because (a) the accident rate is high and (b) there is a wave of new cockpit technology and information architectures about to arrive. Specifically, PC technology can now be incorporated into the cockpit coupled with GPS/Datalink/ADS-B, etc., and the human performance issues associated with this are not currently known.

One committee member suggested an increased focus on GA; however, other committee members felt it important to continue to focus on commercial aviation as well. Another project that drew comment was the electronic flight bag project. Although one committee member felt that the electronic flight bag was beyond the FAA’s purview, others rated it as quite important. This group pointed out that the FAA will be presented with a number of low-end electronic systems and proposals for operation and that the certification group will need to know whether or not to approve proposed systems. Another committee member points out that this project needs to be broadly interpreted, to include all crew information systems that are likely to become installed equipment in the future.

Finally, a number of committee members expressed concern with expenditures in the aeromedical area. This area has consumed roughly 16-20% of the R&D budget for human factors (not counting personnel costs) over the past few years. Although the committee recognizes the importance of the work to supporting accident investigation and litigation, the committee feels strongly that much of the work being done is an operational function, not an R&D function and that the FAA needs to find a more logical method for supporting this work.

In the area of partnerships, the committee examined the following partnerships:

- In-House
- Headquarters
- CAMI
- Tech Center

Human Factors Subcommittee (continued)

- External
- NASA
- Universities
- Industry
- MITRE
- Volpe

The committee felt that not too much was new here since our last report, so we had little in the way of comments. The committee did note, though, that the coordination with MITRE, discussed at one of our last meetings, seems to be improving, with the chief scientist for Human Factors working with MITRE's outcome manager's team. However, the committee also noted that some of the younger scientists still seemed unaware of the process required to get MITRE into the loop. The committee also notes that given the way that MITRE plans its work up front on a yearly basis, it can be difficult for them to respond quickly to changing needs on the part of the FAA.

In terms of process, this also hasn't changed since the last committee briefing. The direction the human factors program sets comes from a number of organizations, such as internal "customers" (such as Certification and Flight Standards), Congress, Industry, the Human Factors Plan, and Expert Advice. The committee notes some continuing coordination problems. They also noted that the human factors group has problems in implementing programs given some of the union agreements that allow the union to make final determination on what goes into operational systems, despite research evidence to the contrary on what features would be most appropriate for a given system.

In the area of additional comments and guidance, the committee returned to a point made in an earlier briefing -- the time scale for showing results is too short. Typically in research, you look for a 5-10 year window from initial basic research to implementable results. Much of the "research" currently being supported by the FAA is not basic research; researchers are being asked for results that can be applied in 6 months or less. This almost constitutes development work. The committee feels that the FAA needs to invest in true basic work if we want the United States to remain on top technologically.

Of course, there is a delicate balance between being responsive to specific acknowledged needs and the need to look to a science base for the future. However, the committee feels that in the desire to bring research into alignment with needs (not just the researcher's ideas of needs), the FAA may have swung the pendulum too far in creating applications, and not science. On the "good news" front, in congressional hearings earlier this year, there was much testimony about this issue, and we believe that Congress may back away from this insistence on results "today".

We also had some observations based on our on-site trips. First, the committee was very impressed by the quality of facilities and the overall quality of research being conducted at CAMI and at the Tech Center. Researchers are clearly enthusiastic about their work and are moving forward with it. However, we would note that individual researchers don't always seem to know how their work fits into the larger scheme of things. Although it has been argued that

Human Factors Subcommittee (continued)

this is a job for administrators, the committee feels that researchers should understand the overall direction and goals of the organization, and should know how their work contributes to that mission.

Further, the committee noted that researchers at the Tech Center were much younger on average than those at CAMI. This was reflected in their presentations and somewhat in the breadth/depth of their research. This has been recognized by administrators who are bringing in some more senior researchers to strengthen the program. Meantime, there should be some concern at CAMI that when their cadre of senior researchers retire, there is not a group of younger researchers working under their direction to continue the programs. In the review, researchers described in-house research on workforce analysis for future AT systems. The committee recommends that the FAA look to themselves for an examination of their own workforce and how to position newcomers and more senior personnel on a more broad basis to ensure that research remains strong across the board as we move into the future.

Appendix

Listing of Topics Funded within Each Research Area

Flightdeck/Maintenance/ Systems Integration Human-centered Automation

- Initiate/coordinate comprehensive program on cockpit automation
- Provide guidance/recommendations for improved training for automated flight management systems & cockpits
- Develop a job aid to help certification personnel and designers address automated flight decks
- Provide industry and FAA guidance to address cultural influence on crewmember use of automated systems
- Provide human factors evaluation for AGATE flight systems

Air Traffic Control/ Airway Facilities Human Factors Human Centered Automation

- Situation awareness and human error in centralized monitor/control
- Baseline controller decision-making strategies
- Decision support automation transitions
- ATC performance and procedures in integrating air-ground separation responsibility

Flightdeck/Maintenance/ Systems Integration Selection and Training

- Methods to integrate performance data with pilot training data to evaluate flight training
- Develop AOP database incorporating user comments
- Provide data analysis and tools for airline scenario-based evaluation
- Provide guidance addressing training crewmember use of advanced automated systems
- Antecedents to cockpit error in air carriers
- Implement advanced GA training techniques
- Complete guidelines for maintenance technician situation awareness training

Air Traffic Control/ Airway Facilities Human Factors Selection and Training

- Develop and validate computerized personnel selection tests
- Develop workforce analysis application to support identification, description, and analysis of gaps between current and future workforce knowledge, skills, abilities, and staffing profiles
- Guidelines to enhance team performance in NAS transitions

Flightdeck/Maintenance/ Systems Integration Information Management and Display

- Complete software for enhanced maintenance documentation
- Develop and implement guidelines for maintenance error investigation and reporting systems
- Complete electronic flight bag usability evaluation tool
- Develop guidelines for design/certification of head-up display for general aviation

Air Traffic Control/ Airway Facilities Human Factors Information Management and Display

- Human-centered design guidelines for ATS displays
- Reduction of paper flight progress strips
- Efficacy of information coding techniques for enhanced future ATS displays
- Identification and display of ATC complexity factors
- Information management in future airway facilities systems
- HF issues in controller/pilot data link communications

Flightdeck/Maintenance/ Systems Integration Human Performance Assessment

- Provide expanded APMS methodologies and analysis to collect/analyze flight simulator data
- Develop guidelines for certification of head-up displays
- Develop guidelines for accident investigation and reporting
- Complete research on aircraft maintenance error reporting systems

Air Traffic Control/ Airway Facilities Human Factors Human Performance Assessment

- Human error mitigation and situation awareness in ATC/ATM
- Human performance modeling integration
- Team processes in centralized monitor/control systems
- Shift work and fatigue
- Baseline assessment of ATC teamwork/flight planning and collaborative decision making
- Task load and DSR performance baseline assessment
- Cognitive performance and expert ATC performance
- HF issues in airspace adjustments and procedures
- SATORI enhancement for display system replacement
- Organization culture and NAS transitions

Aeromedical Medical/Toxicology Factors of Accident Investigation

- Epidemiological assessment of toxicology factors in fatal civilian aviation accidents
- Guidelines to reduce in-flight sudden/subtle incapacitation
- Evaluate autopsy data to determine protective equipment and design practices
- Develop biochemical tests to distinguish between ingested and post-mortem alcohol
- Develop instructional material on the air travel radiation environment
- Develop advanced aeromedical accident research database

Aeromedical Human Survival & Protection in Civil Aviation

- Suitability of component tests as alternative for showing regulatory compliance with crashworthiness standards
- Assess impact protection performance of aircraft seating systems
- Guidelines and procedures for aircraft cabin evacuation & approval guidelines
- Development of improved oxygen mask fit and comfort standards
- Survey to determine if parents flying with small children will divert to other modalities if child restraints are required
- Dynamic modeling to support cabin safety, protection, an aircraft accident research
- Survey of in-flight medical emergencies and defibrillator usage on commercial airline flights

Aeromedical Cabin Health & Environmental Guidelines

- Assessment of aircrew health risks (radiation) during a flying career
- Model of disease transmission in aircraft cabins

Recommendations on FAA's 2002 R&D Investments – April 11, 2000

Report from the Environment and Energy Subcommittee

Chairman: Mr. Jim DeLong

All answers must be qualified because a new relationship is still developing between the Subcommittee and the Office of Environment & Energy. During the past year, AEE has been reorganized to better balance its efforts between noise (i.e., the longstanding, high priority environmental concern) and the newer emissions issues. Separate Noise and Emissions Divisions have been formed, with each responsible for both analysis and policy. Personnel are being added and trained in both divisions. A substantially new panel of Subcommittee members has also been formed during the past year. And, although members generally agree with the priorities and budgets indicated by the White Sheets, the Subcommittee will seek a more detailed understanding of the program in the future. In particular, further balancing of projects might be recommended to reflect changing environmental priorities (e.g., emissions vs. noise) and to better apply the significantly increased budget. Further funding increases might also be requested to accelerate or increase the scope of responses to especially critical environmental issues.

1. **Q: Portfolio Content.** Do the proposed outcomes, outputs and time frames reflected in the “Planning White Sheets” seem correct given the needs of the air transportation system?
 - a. What is missing? That is, what R, E&D initiatives are needed that are not represented by a “Planning White Sheet” in the portfolio?
 - b. What is not needed? What project in the portfolio should be dropped and why?

- A:** The content of the program, particularly the emphasis on noise and emissions modeling tools, seems correct. There is certainly no need to consider dropping any project. However, although the Subcommittee recommends proceeding with the planned effort, there will be a need to reconsider time frames for proposed “outputs” and a different balance of resources between projects. The Subcommittee will closely reexamine all elements of the planned program during the next year. Because ICAO will likely recommend a new noise standard early next year, the Subcommittee especially wishes to ensure an intense study of alternatives for the related transition of the U.S. aviation system, reflecting the various mitigation measures. Additional areas of work will also be considered, including, for example, the effects of anti-icing glycol solutions on the environment, development of cost benefit models, and alternatives for reducing emissions from ground service equipment (GSE).

Environment and Energy Subcommittee (continued)

2. Q: Partnerships. What specific opportunities exist to forge stronger partnerships with industry, academia and/or other government agencies in order to better leverage FAA's R,E&D funding?

A: Evolving priorities for aeronautical R&D within the USG and industry requires continuing consideration of partnerships. There are still, for example, concerns about the NASA aeronautics program and its ability to deliver technology at a high state of readiness for reducing noise and emissions. And with the somewhat new issue of climate change and the related need for substantial increases in aviation system efficiency, additional R&D programs may become increasingly important.

At the end of 1999, the White House National Science & Technology Council announced a "National Research and Development Plan for Aviation Safety, Security, Efficiency and Environmental Compatibility." This "roadmap" offers very ambitious goals; however, current Federal budget levels are not adequate to maintain the proposed schedules. Partnerships between USG agencies, academia and industry may be helpful in achieving progress towards the goals, but even the strongest partnerships cannot compensate for a gross lack of funds.

Within the USG, responsibility for aircraft and engine technology will continue to reside primarily with NASA and DoD. The FAA's special responsibility for Environmental Compatibility was well articulated in the 1997 recommendation of the "White House Commission on Aviation Safety and Security:"

The FAA should develop better quantitative models and analytic techniques to inform management decision-making.

In response, the FAA Office of Environment & Energy is striving to "strengthen its analytic and planning tools, especially through the development of models that give insight into the system-wide consequences of alternative courses of action." Noise and emissions models (i.e., computer simulations) are being developed in cooperation with NASA and DoD, with contributions (e.g., engine and aircraft performance data) from industry. The models are being used to assess and forecast aviation's environmental performance, including the benefits of technology transfer from USG R&D programs to the marketplace. Accuracy is essential to ensure proper policymaking.

Potential cooperative arrangements with EUROCONTROL offer financial and other benefits to the FAA model development program. But the Subcommittee recommends that stronger partnerships should also be sought between FAA organizations (e.g., Airports, Standards, Air Traffic Services) to ensure appropriate objectives and utilization of resources. This may be important to

Environment and Energy Subcommittee (continued)

ensure that all relevant environmental issues are properly addressed. For example, as noted above, consideration of the environmental effects of anti-icing glycol solutions may not be adequately addressed at present.

3. Q: Process. What should the FAA do to improve the process it is now using to engage the Advisory Committee in providing advice on the agency's R,E&D investment portfolio? In particular:

- a. Is the subcommittee structure effective?
- b. Is the information presented in subcommittee and full committee meetings effective? Should more or less or different information be presented?

A: The subcommittee structure has proven to be effective in gaining necessary attention for environmental issues, as well as essential resources for programmatic responses. However, because of the new relationships noted above, additional effort will be required by the Environment & Energy Subcommittee and the responsible FAA managers to determine an appropriate information system for continuing program review. To track the priorities and progress of programs, details such as previously provided in the Research Project Descriptions (RPD), or the equivalent, may be necessary.

4. Q: Additional Guidance and Recommendations. What additional guidance and/or recommendations are offered with the objective of helping FAA to better focus its R,E&D investments on the needs of its customer community?

A: The FAA and NASA have requested the Aeronautics & Space Engineering Board of the National Research Council "to assess whether appropriate research policies and sufficient programs are in place to foster technological improvements to ensure that environmental constraints do not become a significant barrier to growth of the aviation sector." It is recommended that REDAC closely follow this study and offer to advise the study panel.

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Report of the Research Engineering and Development Advisory Committee
Meeting April 11 to 13, 2000

The Research, Engineering and Development Advisory Committee (REDAC) reviewed the FAA's planned R&D investments for FY 2002 during its meeting of April 11 to 13, 2000. The majority of the REDAC supports the requirements shown in the table below. Some members of the committee feel that the sub committees are not given enough detail to make such a decision. We are working on procedural changes to assure that all of the sub committees feel comfortable with the depth of information they receive. We believe these funding levels accurately reflect the appropriations required by each line of business to advance its programs and achieve important goals. These include the strategic plan goals of safety, security, and efficiency as well as the enabling environmental goals.

We note the disparity between the requirements and the Office of Management and Budget (OMB) target level funding. The OMB target falls significantly below the required funding level. Therefore, we strongly support an effort by FAA to develop Flagship Initiatives to supplement the OMB target level funding in order to bring it closer inline with the required funding level. We believe a strong R&D program is essential to our future aviation system, and the required funding level is a step toward strengthening the R&D program that will contribute to achieving the goals of your strategic plan.

Program Area	FY 2002 Requirement (\$M)	FY 2002 OMB Target (\$M)	Delta (\$M)
Aircraft Safety	78.6	66.0	12.6
Aviation Security	92.8	50.2	42.6
Environment & Energy	7.7	7.7	--
R&D Management	2.5	2.5	--
Information Security	10.5	5.5	5.0
Air Traffic Systems	164.8	128.6	36.2
Safe Flight 21	45.0	25.0	20.0
Airport Technology	10.0	7.5	2.5
TOTAL	411.9	293.0	118.9

The majority of the committee endorses the "Aviation System After Next" effort to develop a longer-term vision for the aviation system beyond the year 2020. The FAA and the National Aeronautics and Space Administration (NASA) propose it as a unified effort including government and private-sector stakeholders led by a joint working group

of our Committee and the NASA Aero Space Transportation Advisory Committee (ASTAC). Currently, we are participating with the NASA ASTAC to develop a plan for accomplishing this effort. We feel that it is our responsibility to ensure that future generations of Americans will have the quality of life and economic prosperity that the current national aviation system affords our generation today. A minority of the committee felt that this effort was too far reaching and could not produce meaningful results. They felt the industry would be better served with an effort to better define what comes after Free Flight I/II before efforts are spent going beyond 2020.

We support the congressional direction under the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21) to create a Chief Operating Officer (COO) for the air traffic control system, appointed by the Administrator and reporting directly to the Administrator. We believe that this action is long overdue and have been recommending it for some time now. In April 1997, we presented our National Airspace System (NAS) Air Traffic Management R&D report to Acting Administrator Barry Valentine. One of our primary recommendations in this report was to establish a Deputy Administrator position responsible for the air traffic control system – including the creation, operation, and maintenance of the NAS but not the regulatory obligations. As we said in our 1997 report, the new COO will help breakdown the walls between the engineering and operational organizations and, thereby, focus the necessary actions to achieve a successful NAS. Therefore, we support this important initiative.

We recommend separating the aviation security R&D program from the balance of the R&D program, because its requirements are so demanding that it is draining funds from the remaining R&D program. In the next decade, the aviation security program will require several billion dollars to achieve the zero-tolerance goals established by both Congress and the White House. This puts a tremendous financial burden on FAA as the sole agency responsible for fighting terrorism in our aviation system, because significant increases to the R&D budget to accomplish this mission have not been forthcoming. As the security portion of the R&D budget has increased, the total R&D budget has declined. This has exhausted the balance of FAA's R&D program including air traffic systems, airports, aircraft safety, human factors, and environment and energy. Furthermore, the trend threatens to continue over the next decade unless something is done to correct it. We do not believe the security program goals are unimportant. Our citizens should expect to travel safely in our aviation system. They also should expect to travel in a timely fashion, but the security program alone does not provide these services. There are other efforts within the R&D program that contribute to safety and efficiency. Therefore, we recommend segregating the aviation security R&D program from the balance of your R&D program to protect the continued existence of these programs.

Although we support the goals of the environment and energy program, we believe the program is grossly under funded and may not meet its goals at current funding levels. I have asked Mr. James DeLong, Chairman of our Subcommittee on Environment and Energy, to investigate and report on this issue in more detail. In the meantime, I would like to share some of the subcommittee's preliminary findings. FAA invests \$7.7 million per year in its environment and energy program. This is grossly out of proportion to what

the rest of the community spends each year. For example, Louisville spent an average of \$75 million per year for 10 years to expand its airport. A large part of that expenditure was related directly to environmental concerns, primarily noise. Compare FAA's \$7.7 million to Louisville's \$75 million; that is one airport and one investment. It seems out of proportion. Denver built a new airport for no other reason than environmental concerns, specifically noise and emissions. The price tag was \$4.5 billion. In the first year, Denver violated noise restrictions with fines of \$35 million for that year alone. These were levied as landing fees, which resulted in higher airfares. We all pay when airfares increase. Studies show that a 10 percent increase in airfares results in a reduction in air travel by as much as 27 percent. That is quite an elastic demand curve compared to automobile travel, which reduces only 2-3 percent for a 10 percent increase in gasoline prices. When airfares increase, the economy suffers and so does our quality of life.

Another example is Seattle Tacoma, which plans to build a new runway to access the Far East. It should cost \$60 million, but it probably will cost \$300 million after addressing environmental concerns. These concerns include relocating 10 acres of wetlands and 700 homes and businesses; sound proofing historic sites, schools, and 170 homes; and using staged construction due to environmental restrictions, which will delay completion of the project, thereby, increasing cost.

Historically, the FAA has set aside about 12% of its annual airport budget for noise abatement or mitigation. This will amount to \$300 million in FY 2002. This type of expenditure will continue for the foreseeable future for sound proofing and acquiring homes. As stated above, the \$7.7 million allocated to environmental and energy research programs pales in comparison. The Subcommittee on Environment and Energy will consider a detailed recommendation at their next meeting for the FAA to fund a feasibility study for the development of a "green" engine focusing on how some of the abatement funds might be better directed toward a potential solution to the noise problem rather than building ever larger buffer zones.

Environmental impacts extend beyond our national borders. They threaten our global competitiveness. Europe is attempting to eliminate acoustically treated aircraft from operating in Europe. This action would restrict our aircraft from that market. The FAA's environmental R&D provides the regulation, certification, and policies that the industry needs both in the U.S. and worldwide. We recommend more funding for environment and energy, because we see it as perhaps the greatest inhibitor to the growth of our industry.

We want to direct your attention to the fuel problem facing general aviation. There is a worldwide trend to phase out leaded general aviation fuel. The European Union plans to ban leaded fuel after 2005. We believe that the effort to find a replacement for leaded fuel will require R&D funds of \$4 million in FY 2002. Current general aviation fuel supplies are drying up and represent such a small percentage of the petroleum industry that the industry may stop producing it. These factors drive the need for alternative fuels for general aviation.

However, new fuels require new engine technology, and this requires retrofitting the fleet with new engines, which could take 30 years or more. There is compelling need for an alternative fuel that is transportable, adaptable to the existing fleet, and available in large quantities. Without it, we risk losing general aviation. Without it, we risk losing the primary training-arena that feeds pilots to the regional and commercial fleet. Without it, we fear fatalities as aviators attempt to use unapproved alternative fuels. Therefore, we recommend \$4 million in R&D to upgrade the FAA research lab that certifies general aviation fuels. One of our members describes the current facility as shockingly archaic.

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